Before the Committee on Commerce,
Science, and Transportation

U.S. Senate

For Release on Delivery
expected at
9:30 am EST
Thursday
May 11, 2000
Report No. RT-2000-092

Reauthorization of the Pipeline Safety Program

Statement of
The Honorable Kenneth M. Mead
Inspector General
U.S. Department of Transportation

Mr. Chairman and Members of the Committee:

We appreciate the opportunity to be here today to discuss the reauthorization of the Department of Transportation's pipeline safety program.

The nation's pipeline infrastructure includes roughly 2.2 million miles of pipe, including 156,000 miles of hazardous liquid transmission pipelines, 325,000 miles of natural gas transmission pipelines, and 1.7 million miles of natural gas distribution pipelines. These pipelines carry vast quantities of natural gas, petroleum products, and other materials to fuel our commercial and consumer demands. Pipelines are a relatively safe way to transport energy resources and other products, but they are subject to forces of nature, human actions and material defects that can cause potentially catastrophic accidents.

Following the deadly pipeline explosion and fire in Bellingham, Washington in June 1999, Senator Patty Murray requested the Office of Inspector General to review the Research and Special Programs Administration's (RSPA) Office of Pipeline Safety (OPS). Our March 2000 audit report identified needed improvements in OPS's oversight of the Nation's pipeline infrastructure. My testimony today will address four issues:

RSPA has not implemented Congressional safety mandates related to defining environmentally sensitiv and high-density population areas, identifying pipelines in these areas, or requiring increased pipeline inspections. Critical safeguards required by Congress for hazardous liquid and natural gas pipelines ar at least 5 years overdue and could take as long as 7 additional years for just large hazardous liquid pipeline operators to complete these inspections.

Pipeline safety research and development must be expanded to improve the capabilities of internal inspection devices – referred to as "smart pigs." Previous OPS research has concluded that smart pigs can detect certain defects in a pipeline before failures occur, but they have limited capabilities to pinpoint stress corrosion cracks, longitudinal mechanical damage, and defects in seam welds and pipe materials.

OPS also must expand research to develop new inspection technologies for pipelines that cannot accommodate a smart pig. Roughly 11 percent of all hazardous liquid pipelines cannot accommodate the use of smart pigs and OPS lacks statistical data on the miles of natural gas pipelines that can accommodate a smart pig. For those pipelines that cannot accommodate a smart pig, operators must rely on visual inspections and hydrostatic pressure testing to check the condition of the pipe. However, visual inspections can only look for evidence of leaks at the surface, and hydrostatic tests stress the pipe material and can cause microfractures or crack defects harmful to the pipe.

Pipeline accident data collection improvements are needed to enable OPS to focus its resources on the most important safety issues and to measure safety program performance. We found that pipeline operators are incorrectly using the "Other" causal category to report the causes of accidents. In fact, the leading reported cause of hazardous liquid accidents for 1999 was "Other." In the case of natural gas accidents, we found "Other" was being used to describe accidents caused by incorrect operation by

pipeline personnel, equipment malfunctions, or failed pipes and welds because these causes are not included on the accident form. OPS should modify its accident report forms to include additional categories identifying the causes of pipeline accidents and thereby reduce the use of the "Other" category.

Pipeline inspectors are not adequately trained on either the use of high-tech instruments or the interpretation of test results. Incorrect operator decisions contributed to 16 hazardous liquid pipeline accidents in 1999. Specialized training is essential for pipeline inspectors to make more comprehensive safety assessments and to ensure pipeline operators are qualified to do their job, thereby reducing the probability and consequences of serious accidents.

First, RSPA has Yet to Implement 1992 Congressional Safety Mandates. In 1992, Congress established mandates intended to increase pipeline safety by requiring pipeline operators to conduct increased inspections in areas where consequences of a pipeline rupture would be most severe. RSPA's actions toward completing the mandates are at least 5 years behind the Congressional completion dates.

Congress mandated that OPS define the criteria to identify high-density population areas for natural gas and hazardous liquid pipelines and environmentally sensitive areas for hazardous liquid pipelines, and to develop an inventory of pipelines in these areas by October 1994. The definition for an environmentally sensitive area has not been established, and until it is, OPS cannot develop an inventory of pipelines located in these areas. The 1992 Act also established a 1995 deadline for the Secretary to prescribe standards for periodic pipeline inspections and the use of smart pigs, or an equally effective alternative method.[1] Although smart pigs can detect certain types of defects in a pipeline before it fails, OPS has not established requirements for the Congressionally mandated increased inspections including the use of smart pigs.

A Notice of Proposed Rulemaking published in April 2000 addressed periodic pipeline inspection standards (using either a smart pig or an equally effective method), but only for large hazardous liquid pipeline operators.2 The proposed rulemaking requires operators to complete baseline inspections to determine the existing condition of their pipelines within at least 7 years of the effective date of the final rule. OPS plans to issue the final rule by September 2000, allowing operators until 2007 to complete baseline assessments. This timeframe is too long. The American Petroleum Institute stated earlier this year that 95 to 98 percent of the mileage of large hazardous liquid pipelines operators can currently

[1] The Accountable Pipeline and Safety Act of 1996 (Public Law 104-304) amended the Pipeline Safety Act of 1992 by removing the requirement for periodic inspection standards and giving the Secretary the discretion to determine if mandatory periodic inspections are necessary.

[2] Large hazardous liquid pipeline operators are defined in the Proposed Rulemaking as operators of pipelines of 500 miles or more.

accommodate a smart pig to perform the baseline inspection. Furthermore, the 10-year timeframe for subsequent pipeline re-inspections to determine deterioration is also too long. OPS does not address natural gas pipelines in its current rulemaking. OPS needs to aggressively pursue the development of regulations for increased inspections on these pipelines in high-density urban areas.

Second, Enhancements are Needed in Pipeline Safety Research and Development. Pipeline operators need advanced technologies to locate defects and monitor pipelines before a failure occurs. Early detection of serious defects in a pipeline reduces the risk of catastrophic accidents. RSPA's current pipeline research and development (R&D) program has resulted in improved defect detection by internal inspection devices. However, RSPA's research and development program now needs additional emphasis in three areas:

Improving the capabilities of smart pigs to detect pipe defects such as stress corrosion cracks and seam weld deficiencies or irregularities,
Enhancing technologies to detect the severity of pipeline corrosion, and
Developing inspection and monitoring technologies for pipelines that cannot accommodate smart pigs. Roughly 11 percent of all hazardous liquid pipelines (2 to 5 percent of the large ones) cannot be 'pigged', but OPS does not know what percentage of natural gas transmission pipelines cannot accommodate a smart pig.

We note Congress' strong support in the reauthorization bills for expanding research and development programs on inspection technologies. We support its efforts to advance pipeline technologies that will enhance pipeline safety.

Third, the Collection of Pipeline Accident Data Needs Improvement. OPS must have accurate accident data to focus its inspection and research resources and to measure safety program performance. In order to do this, accident reports should use precise categories that identify the causes of pipeline accidents. OPS accident forms currently use up to seven categories including "Other" to summarize the cause of an accident. Data for hazardous liquid accidents list "Other" as the leading cause of accidents. This category increased from 29 percent in 1998 to 37 percent in 1999. However, because there are only 3 specific causal categories on the natural gas accident form, operators of natural gas transmission lines use the "Other" category to report such causes as "Incorrect Operation by Operator Personnel" and "Failed Weld."

OPS should expand accident categories to encompass the most frequent accident causes now being grouped together as "Other." One of RSPA's goals is to reduce "Outside Force Damage" accidents by 25 percent over the next 3 years. However, with the category "Other" being used so often, RSPA cannot accurately measure how well it is doing. For example, our examination of hazardous liquid accident reports found 9 of 44 hazardous liquid pipeline accidents in 1998 were incorrectly categorized as caused by "Other" when they should have been classified as "Outside Force Damage." The limitations of the current accident reporting were recognized in both a 1998 National Transportation Safety Board (NTSB) report and 1999 American Petroleum Institute report that recommended accident reporting be revised to request more comprehensive data.

Last, Specialized Training is Needed for Pipeline Inspectors and Operators. Pipeline inspectors are not trained on either the use of current state-of-the-art technology or the expertise in smart pig data analysis. The data obtained from smart pig inspections are an important indication of a pipeline's condition. In addition, incorrect operator decisions contributed to hazardous liquid pipeline accidents. Specialized training is essential for pipeline inspectors to make more comprehensive safety assessments and to ensure pipeline operators are qualified to do their jobs, thereby reducing the probability and consequences of serious accidents.

Our review of the OPS inspector training curriculum noted its lack of training on smart pig technology and how to interpret smart pig data. Since the use of smart pig technology is expected to grow, we recommend OPS inspectors be trained to interpret results from smart pig inspections. The OPS inspector would then possess the knowledge to independently assess a pipeline's condition and could quickly make safety improvement recommendations, rather than wait for interpretational reports as they currently do.

Better pipeline operator qualifications can also improve safety. Incorrect operator decisions contributed to 16 hazardous liquid pipeline accidents in 1999. We support reauthorization provisions requiring operators to submit their training plans to the Secretary for approval. This issue warrants close monitoring to assure the process does not focus on the paper record without assurance that the individuals have the necessary knowledge and skills. We also agree with provisions for periodic retraining and reexamination of pipeline personnel.

BACKGROUND

The pipeline infrastructure of the United States consists of roughly 2.2 million miles of pipe including 156,000 miles of hazardous liquid transmission pipelines, 325,000 miles of natural gas transmission pipelines, and 1.7 million miles of natural gas distribution pipelines. Each year these pipelines transport 617 billion ton-miles

of oil and oil products and over 20 trillion cubic feet of natural gas. Pipelines are a relatively safe way to transport energy resources and other products, but they are subject to forces of nature, human actions and material defects that can cause potentially catastrophic accidents. Although the number of natural gas and hazardous liquid transmission pipeline accidents was relatively constant from 1995 through 1997, natural gas accidents increased by 25 in 1998, and then dropped by 45 in 1999.3 Conversely, hazardous liquid accidents decreased by 22 in 1998 and remained relatively constant in 1999 (as shown in Figure 1).

Figure 1
Transmission Pipeline Accidents

The Office of Pipeline Safety administers the Department's national regulatory program to assure the safe operation of the Nation's transmission pipelines. OPS develops regulations on risk management, design safety, construction, testing, operations, maintenance, and emergency response of pipeline facilities.

Outstanding Congressional Mandates

RSPA has Yet to Implement 1992 Congressional Safety Mandates. In 1992, Congress established mandates intended to increase pipeline safety by requiring pipeline operators to conduct increased inspections in areas where consequences of a pipeline rupture would be most severe. These mandates were to establish criteria identifying high-density population and environmentally sensitive areas, inventory pipelines in these areas, and prescribe regulations for increased inspections on these pipelines, including the use of internal inspection devices. RSPA's proposed completion dates for some of the mandates are at least 5 years behind the Congressional completion dates. The following table depicts the Congressional mandates and their deadlines.

OPS has not Implemented Congressionally Mandated Standards

[3] The accident reporting criteria were changed in mid-1994 for hazardous liquid pipelines. Previously, operators were required to submit an accident report if property damage exceeded $5,000. OPS raised the threshold to property damage exceeding $50,000.

Hazardous Liquid Pipelines
Establish criteria to identify high-density and environmentally sensitive areas
Inventory pipeline facilities located in high-density areas
Inventory pipeline facilities located in environmentally sensitive areas
Establish additional safety standards related to periodic inspections in high-density areas, if necessary
Establish additional safety standards related to periodic inspections in environmentally sensitive areas, if necessary

Definition of Areas. Congress expected OPS to define environmentally sensitive and high-density population areas and to develop an inventory of pipelines in these areas by October 1994. These actions have not been done. Until the definitions are established, OPS cannot develop an inventory of pipelines located in these areas. According to OPS officials, this lengthy delay is primarily attributable to the difficulty in developing a consensus on the definition of an environmentally sensitive area among divergent groups including Federal and state governments, environmental groups, and the pipeline industry. Once these areas are defined, an inventory would identify pipelines where increased inspections may be required.

Pipeline Inventory. Currently, the inventory of pipelines in high-density and environmentally sensitive areas relies on voluntary operator submissions of pipeline location data. In March 1999, OPS developed standards for operators to submit their pipeline inventories. However, as of May 2000, pipeline operators have submitted only 10 percent of total pipeline mileage through this voluntary initiative. OPS needs to immediately initiate a rulemaking process to require operators to submit their pipeline location data.

Establishment of Inspection Standards. In most cases, smart pigs can warn of problems in a pipeline before a rupture occurs. The 1992 Act established a 1995 deadline for the Secretary to prescribe standards for periodic pipeline inspections using smart pigs or an equally effective alternative method. OPS has not yet established requirements for the increased inspections including the use of smart pigs. According to an OPS official, internal inspection technology in 1994 had only a limited capability to identify defects that could cause ruptures. However, the capabilities of internal inspection technology have improved since 1994. In April 2000, OPS issued a Notice of Proposed Rulemaking requiring operators of large hazardous liquid pipelines (those with over 500 miles of pipelines) to use this technology, or an alternate equally effective method, to inspect pipelines. OPS plans to issue final regulations for large hazardous liquid pipeline operators in September 2000.

Rulemaking Timeframes. OPS's April 2000 Notice of Proposed Rulemaking allows large hazardous liquid pipeline operators until at least 2007 (pending the effective date of the final rule, planned for September 2000) to complete baseline assessments of their pipelines. This timeframe for baseline assessments is too long. The American Petroleum Institute stated earlier this year that 95 to 98 percent of the mileage of large hazardous liquid pipeline operators can currently accommodate a smart pig to perform the baseline assessments.

Once the baseline is completed, a subsequent re-inspection is required by the April 2000 Notice of Proposed Rulemaking. RSPA's rulemaking proposes a 10-year re-inspection interval to determine any deterioration in the condition of the pipeline. This interval is also too long.

We support reauthorization provisions to expedite RSPA's completion of all outstanding Congressional mandates. As Congress intended back in 1992, these additional protections are critically needed to reduce the risk of pipeline accidents and the devastating consequences on the public and the environment.

Pipeline Research

Pipeline Safety Research and Development Should be Expanded. Early detection of serious problems in a pipeline reduces the risk of a catastrophic loss of human life and long-term damage to the environment. Pipeline operators and Federal and state inspectors need advanced technologies to locate problems and monitor pipelines before a failure occurs. High technology inspection devices could give operators and inspectors early warnings of serious problems in a pipeline and lower the risk of pipeline releases.

RSPA's current pipeline research and development (R&D) program has resulted in beneficial technical data on internal inspection devices. The research concluded that smart pigs are reliable for detecting internal pipe corrosion, certain types of external mechanical damage, and pipe metal loss, but they have limited capabilities in pinpointing stress corrosion cracks, longitudinal mechanical damage, and defects in seam welds and pipe materials. OPS's program now needs to focus on three areas:

Improving the capabilities of smart pigs to detect pipe defects such as stress corrosion cracks, longitudinal mechanical damage, and defects in seam weld and pipe materials,
Enhancing technologies to detect pipeline corrosion and its severity, and
Developing technologies for internal inspection and monitoring of pipelines that cannot accommodate smart pigs.

Capabilities of Smart Pigs. Pipeline operators use several inspection methods to ensure the integrity and safe operating condition of a pipeline (including smart pigs, hydrostatic pressure testing, visual inspection, and pipe weld x-rays). Smart pigs, which travel inside a pipe, are the most reliable technology currently available to detect corrosion, metal loss, and mechanical gouges or dents, without excavating a pipe. However, they have limited ability to detect other types of serious defects, such as stress corrosion cracks, longitudinal mechanical damage, and defects in seam welds and in pipe materials. We noted that 10 percent of hazardous liquid pipeline accidents in 1999 were caused by failed pipe or welds, which might have been prevented if better inspection technology were available. OPS research should focus

on expanding the smart pig's capabilities to pinpoint these types of pipeline defects before a failure occurs.

Detecting Pipeline Corrosion. While current smart pig technology can generally detect pipeline corrosion, R&D work is needed on advanced technologies to detect additional types of corrosion and the severity and extent of all types of corrosion. For example, current smart pigs have a limited capability to pinpoint stress corrosion cracking, a type of corrosion caused by temperature fluctuations and electric charges in the line. In 1999, corrosion caused almost one-fourth (23 percent) of all transmission pipeline failures and was the second leading cause of accidents. Corrosion caused the failure of an 8-inch pipeline in Lively, Texas, in 1996. A fire erupted when 5,518 barrels of liquid butane were released, resulting in 2 fatalities and the evacuation of 25 families. Property damage totaled $217,000. Although pipeline safety regulations provide standards to prevent corrosion, it is clear that OPS should focus additional research to better analyze the severity and extent of corrosion, including stress corrosion cracking, with a goal of substantially reducing the number of accidents caused by corrosion.

Alternative Inspection and Monitoring Technologies. A pipe's size, configuration, angle bends, and valve designs can prohibit a smart pig from moving inside the pipeline, and natural gas pipelines are most likely to require modifications for their use. Although there are 325,000 miles of natural gas transmission pipelines, OPS does not have specific data on the percentage of miles that can accommodate smart pigs. For hazardous liquid pipelines, a February 2000 American Petroleum Institute survey concluded that smart pigs could be used in 89 percent, or roughly 139,000 miles, of these pipelines.

Additional research is needed to identify new inspection and monitoring technologies for detecting potentially dangerous defects in pipelines that cannot be "pigged." Hydrostatic pressure testing is widely used by industry as an alternative to smart pigs, but it can be harmful to a pipe by causing tiny fractures or cracks. Furthermore, this technique provides only a 'snapshot' of a pipe's condition and does not determine the extent or severity of corrosion or other defects.

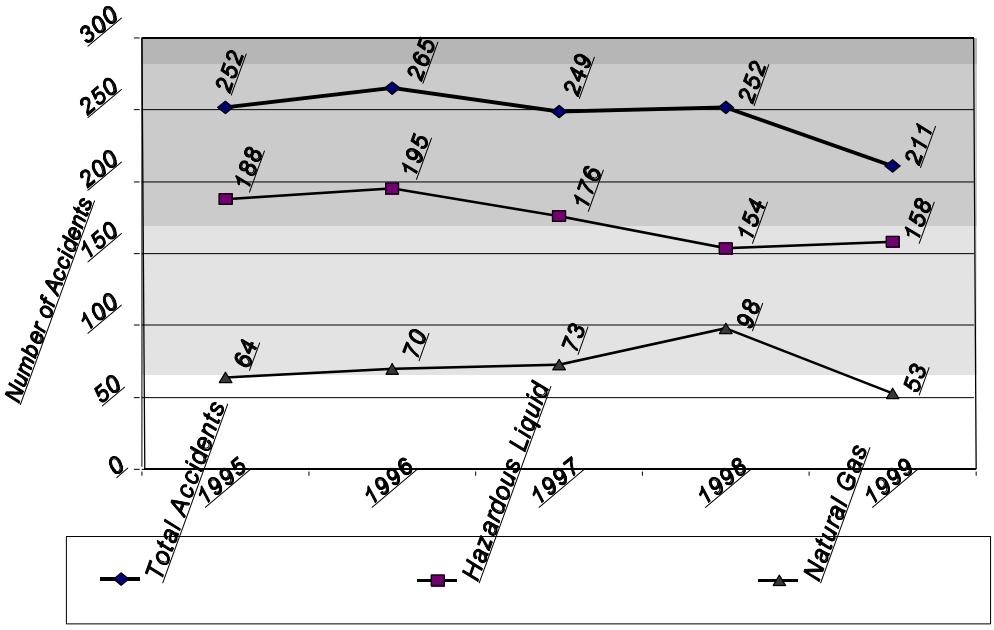
In our review of the various reauthorization bills, we noted Congress' strong support for expanding research and development programs on inspection technologies. We support legislative efforts to further research that will lead to advances in pipeline inspection technologies.

Pipeline Accident Data Collection

The Collection of Pipeline Accident Data Needs Improvement. OPS must have accurate accident data to focus its inspection and research resources and to measure safety program performance. Accident reports should use precise categories that identify the causes of pipeline accidents. OPS accident forms currently use up to seven categories including "Other" to summarize the cause of an accident. For example, in the case of natural gas accidents, we found "Other" could be used to describe accidents caused by incorrect operation by operator personnel, equipment malfunctions, or failed pipes and welds because these causes are not included on the accident form. Table 1 lists the cause categories on OPS accident forms for hazardous liquid and natural gas transmission pipelines, as well as 1998 reported accidents.

Table 1

Accident Form Causal Categories and 1998 Reported Accident Occurrences


Number of Accidents
300
250
200
150
100
50
0
252
265
249
252
211
188
195
176
154
158
64
70
73
98
53
1995
1996
1997
1998
1999
Total Accidents
Hazardous Liquid
Natural Gas

*Totals do not add up to 100% because of rounding.

Source: Office of Pipeline Safety accident database

We found data for hazardous liquid accidents list “Other” as the leading cause of accidents. This category increased from 29 percent in 1998 to 37 percent in 1999. OPS should expand accident categories to encompass the causative factors now being grouped together as “Other.” The limitations of the current accident reporting were recognized in both a 1998 National Transportation Safety Board (NTSB) report and a 1999 American Petroleum Institute report that recommended accident reporting be revised to request more comprehensive data.

One of RSPA's goals is to reduce “Outside Force Damage” accidents by 25 percent over the next 3 years. With the category "Other" used so often, RSPA cannot measure how well it is doing. Our analysis found 9 of 44 hazardous liquid accidents that occurred in 1998 were incorrectly categorized as caused by "Other" when they should have been classified as caused by "Outside Force Damage."

OPS also needs to issue new regulations that require operators to correct inaccurate accident reports they have submitted. Under current regulations, OPS is unable to correct inaccurate information from operators’ accident reports without the operators’ consent. For example, in eight transmission pipeline accidents investigated by NTSB between 1994 and 1998, in only one case did the operator submit an updated accident form reflecting the NTSB results, although differences existed between the results of NTSB investigations and the information originally submitted by operators to OPS. In three cases, the NTSB investigation reported a different cause for the accident, and in five cases, NTSB investigations reported $20.4 million more in property damage. As a result, the OPS accident database retained inaccurate program performance information.

We endorse including provisions in the reauthorization that require the development of a data collection plan and revisions to accident report forms and instructions that are essential for detailed analysis of accident causes.

Training of Inspectors and Operators

Specialized Training is Essential for Pipeline Inspectors and Operators. The responsibility for pipeline safety is shared among OPS, the States, and pipeline operators. Pipeline inspectors need state-of-the-art skills, expertise, and ability to make accurate safety assessments that lower the risk of pipeline failures. In addition, pipeline operators must be well qualified to be the “safe drivers” behind operation of the nation’s pipeline system.

Our review of the OPS inspector training curriculum noted a lack of courses on smart pig technology. OPS estimates that operators conduct smart pig inspections on 6,500 miles of natural gas and 12,480 miles of hazardous liquid pipelines each year, which could include pipelines in high-density population or environmentally sensitive areas. For example, smart pigs are run annually through the 800-mile Trans-Alaska Pipeline, which extends through some of the most sensitive environments on the continent.

The data obtained from smart pig inspections are an important indication of a pipeline’s condition. Yet, OPS does not train its inspectors on how to interpret these data. As a result, the OPS inspection force must rely on a report prepared by the pipeline operator or smart pig vendor for general information on a pipeline’s present condition. We find this condition unacceptable. As the use of smart pig technology is expected to grow, we recommend the addition of an OPS training program on the interpretation of results from smart pig inspections. The OPS inspector would then possess the knowledge to independently assess a pipeline’s condition and make safety improvement recommendations.

Several reauthorization provisions seek to expand the states’ role in the inspection of interstate pipelines. In sharing the safety oversight role, Federal and state inspectors have a greater opportunity to leverage limited resources for increasing the number and quality of pipeline inspections. State agencies would also be able to address numerous local issues and provide a local presence to address pipeline safety. Therefore, we also support these provisions.

To ensure consistent implementation of pipeline inspection regulations, state pipeline inspectors should receive the same level of training as required of Federal inspectors. As Federal training requirements change, such as a new requirement for smart pig training, so should the states.’ The safe operation of our Nation’s pipelines depends on uniform educational standards for the entire pipeline safety inspection workforce. One possible way of ensuring the standards are met would be testing or certification.

Incorrect operator decisions contributed to 16 hazardous liquid pipeline accidents in 1999, resulting in 4 injuries and almost $3 million in property damage. In 1999, a Conoco Inc. hazardous liquid pipeline spilled oil and gasoline in Oklahoma, resulting in 2 injuries and $2 million in property damage, or two-thirds of the property damage for the entire year. The operator listed the cause of the accident as “Incorrect Operation by Operator Personnel.”

We support reauthorization provisions to ensure pipeline operators are qualified to do their job, thereby reducing the probability and consequences of serious accidents. Reauthorization provisions that require operators to submit their qualifications programs to the Secretary for approval and require periodic retraining and reexamination of pipeline personnel would be beneficial. Operators should be subjected to stringent qualifications programs and trained to react to abnormal operating conditions when they occur. This issue warrants close monitoring to assure the process does not focus on the paper record without assurance that the individuals have the

necessary knowledge and skills.

Mr. Chairman, this concludes my statement. I would be happy to answer any questions you might have.